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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/773,317	02/09/2004	Fusazumi Masaka	026035-00010	6655

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EXAMINER	
LEWIS, BEN	

ART UNIT	PAPER NUMBER
1745	

DATE MAILED: 06/30/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/773,317	MASAKA ET AL.	
	Examiner	Art Unit	
	Ben Lewis	1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-11 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-11 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Detailed Action

1. The Applicant's amendment filed on April 11th, 2006 was received. Claim 1 was amended. Claims 7-11 were added.

2. The text of those sections of Title 35, U.S.C. code not included in this action can be found in the prior Office Action (issued on January 11th, 2006).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claim1-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bonsel et a. (U.S. Patent No. 6,197,147 B1) and further in view of Sompalli et al.

With respect to claims 1 and 11, Bonsel et al teach a process for continuous production of membrane-electrode composites wherein to improve the adhesion and to bond the components, the contacting material or at least one flat face of the membrane or both components can be incipiently dissolved, wetted or incipiently swollen by a solvent or by a polymer solution, and the components, i.e. one or both flat faces of the

ion-conductive membrane and at least one electron-conductive contacting material, can then be fitted together by pressing and bonded by lamination (Col 6 lines 34-42). Bonsel et al does not specifically teach wherein the a good solvent for the electrolyte membrane is applied to at least one of facing surfaces of the opposed electrode substrate. However, Sompalli et al. teach methods of preparing membrane electrode assemblies wherein in the pretreatment approach, a porous support substrate is coated with a wetting solvent such that the solvent is imbibed into the pores. A slurry is formed including an ionically conductive material, a catalyst supported on an electrically conductive material, and a solvent that is non-wetting to the porous substrate. The slurry is well mixed and applied as a layer to the surface of the porous support substrate and dried to form a film. The film is applied to a membrane, and heat and pressure are applied to form a membrane electrode assembly. Advantageously, this method controls the drying to form a more robust electrode by preventing electrode shrinkage and subsequent cracking of the electrodes (Col 1 lines 45-67). Therefore it would have been obvious to one of ordinary skill in the art to incorporate the coating of the electrode substrate of Sompalli et al into the MEA fabrication process of Bonsel et al because Sompalli et al teach that advantageously, this method controls the drying to form a more robust electrode by preventing electrode shrinkage and subsequent cracking of the electrodes (Col 1 lines 45-67).

Regarding the good solvent being applied in an amount of from 0.001mg/cm^2 to 10mg/cm^2. Bonsel et al teach The membrane thickness is preferably in the range from 0.1μm to 10 mm, in particular from 3μm to 1 mm. Moreover, it must be ensured in the

processing of the polymers to give the membrane, that the latter is gas-tight (Col 3 lines 40-55). The coating of the components can be carried out either with pure solvent or with a polymer solution, in which case the polymer concentration can amount to 0 to 100% by weight, preferably 5 to 50% by weight. Polymers which can be used for the preparation of the coating solutions are the abovementioned ion-conductive polymers. Preferably, a polymer solution of the polymer forming the ion-conductive membrane is used for coating. The coating is applied particularly in a layer thickness from 1 to 200μm especially 5 to 100μm (Col 6 lines 41-67).

The instant specification recites that the electrolyte membrane obtained as described above will range in dry thickness from 10 to 100μm, and preferably from 20 to 80μm (Paragraph 0117). Bonsel et al do not disclose any coating weight per unit area data the solvent. However, it is the position of the examiner that such properties are inherent, given that the coated membrane of Bonsel et al has a thickness that falls with in the range of the thickness of the coated membrane of the instant application. A reference which is silent about a claimed invention's features is inherently anticipatory if the missing feature is necessarily present in that which is described in the reference. In re Robertson, 49 USPQ2d 1949 (1999).

With respect to claim 2, Bonsel et al teach that for coating, the membrane is taken past the slot die either in the horizontal direction (above or below the die) or in the

vertical direction (ascending or descending). In the case of conditioning on both faces of the membrane, the application of the solvent or polymer solution can be carried out correspondingly by passing the membrane through by means of two slot dies or by conditioning of the membrane in a dipping bath which contains the solution to be coated (Col 6 lines 64-67; Col 7 lines 1-4).

With respect to claim 3, Bonsel et al teach that the coating of the components can be carried out either with pure solvent or with a polymer solution, in which case the polymer concentration can amount to 0 to 100% by weight, preferably 5 to 50% by weight. Preferably, a polymer solution of the polymer forming the ion-conductive membrane is used for coating (Col 6 lines 43-57). Alternatively, the membrane can be coated by taking it past a blade (film casting). The width of the blade is preferably in the range from 0.1 to 5 m with a slot width in the range from 5 to 500 um. The ribbon speed is in this case especially between 0.5 mm/second and 10 m/second, preferably 5 mm/second to 1 m/second (Col 7 lines 5-10).

With respect to claims 4 and 6, Bonsel et al teach that the ion-conductive membrane is used as a membrane which contains a polymer from the group comprising the polyarylether-ketones, polyarylene sulfides, polyarylether-sulfones, poly-(1,4-phenylene)s and polybenzimidazoles or from the group comprising the sulfonated polyaramides or a completely fluorinated polymer.

With respect to claim 5, Bonsel et al teach that in order to improve the adhesion between the membrane and the contacting material, the membrane can, if appropriate, be at least partially plasticized before the lamination process either by swelling in a non-solvent, for example water, acetone, methanol or another aliphatic alcohol, or by swelling in mixtures of a solvent, preferably a predominantly polar aprotic solvent, for example N-methylpyrrolidone (NMP), dimethyl sulfoxide (DMSO), dimethylformamide, g-butyrolactone, or protic solvents such as, for example, sulfuric acid or phosphoric acid or a non-solvent.

With respect to claim 7, Bonsel et al teach that one possibility for such a conditioning comprises, for example, passing the laminate in ribbon form through a drying section, for example a circulating air oven, heated to 10 to 250 ^{0}C., especially 20 to 200 ^{0}C. In this way, still adhering solvent residues or water are evaporated (Col 7 lines 54-67).

With respect to claim 8, Bonsel et al teach that in a further process variant, the removal of the superfluous, still adhering components can take place in a downstream washing step. Thus, for example, still adhering solvents or non-solvents or polymer components can be extracted by a liquid which does not dissolve the membrane-forming polymers. For example, water/NMP mixtures and mixtures of NMP and lower aliphatic alcohols are used here (Col 8 lines 1-15).

With respect to claim 9, Bonsel et al teach that for coating, the membrane is taken past the slot die either in the horizontal direction (above or below the die) or in the vertical direction (ascending or descending). In the case of conditioning on both faces of the membrane, the application of the solvent or polymer solution can be carried out correspondingly by passing the membrane through by means of two slot dies or by conditioning of the membrane in a dipping bath which contains the solution to be coated (Col 6 lines 64-67); (Col 7 lines 1-5).

With respect to claim 10, Bonsel et al teach that preferably, the contacting material and/or the ion-conductive membrane are brought together as two-dimensional structures and laminated at a temperature in the range from 5 to 300 ^{0}C., especially 25 to 200 ^{0}C., and a suitable contact pressure, preferably in the range from 10^{7} to 10^{12} Pa, especially 10^{8} to 10^{10} Pa (Col 7 lines 10-25).

Response to Arguments

5. Applicant's arguments filed on April 11th, 2006 have been fully considered but they are not persuasive.

Applicant's principle arguments are

(a) It is not disclosed that a good solvent is applied to at least one of the facing surfaces of the opposed electrode substrate and the electrolyte membrane, in order to bond the membrane with the electrode substrates. Bonsel et al. suffers from the problem that by applying the sulfonated polymer solution to the surfaces of the membrane an interlayer is formed between the membrane and the electrode substrate, and the thickness of membrane-electrode assembly is increased.

In response to Applicant's arguments, please consider the following comments.

(a) Bonsel et al does not specifically teach wherein the a good solvent for the electrolyte membrane is applied to at least one of facing surfaces of the opposed electrode substrate. However, Sompalli et al. teach methods of preparing membrane electrode assemblies wherein in the pretreatment approach, a porous support substrate is coated with a wetting solvent such that the solvent is imbibed into the pores. A slurry is formed including an ionically conductive material, a catalyst supported on an electrically conductive material, and a solvent that is non-wetting to the porous substrate. The slurry is well mixed and applied as a layer to the surface of the porous support substrate and dried to form a film. The film is applied to a membrane, and heat and pressure are applied to form a membrane electrode assembly. Advantageously, this method controls the drying to form a more robust electrode by preventing electrode shrinkage and subsequent cracking of the electrodes (Col 1 lines 45-67). Therefore it would have been obvious to one of ordinary skill in the art to incorporate the coating of the electrode substrate of Sompalli et al into the MEA fabrication process of Bonsel et al

because Sompalli et al teach that advantageously, this method controls the drying to form a more robust electrode by preventing electrode shrinkage and subsequent cracking of the electrodes (Col 1 lines 45-67).

Conclusion

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ben Lewis whose telephone number is 571-272-6481. The examiner can normally be reached on 8:30am - 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Ben Lewis

PATRICK JOSEPH RYAN
SUPERVISORY PATENT EXAMINER

Patent Examiner
Art Unit 1745